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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PETITION FEE Under 37 CFR 1.17(f), (g) & (h) TRANSMITTAL (Fees are subject to annual revision) Send completed form to: Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450	Application Number	10/771,453
	Filing Date	February 5, 2004
	First Named Inventor	Y. WATANABE et al
	Art Unit	2186
	Examiner Name	TBD
	Attorney Docket Number	NIT-409

Enclosed is a petition filed under 37 CFR 1.102(d) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of \$ 130.00 is enclosed.

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

Payment of Fees (small entity amounts are NOT available for the petition (fees))

- ☒ The Commissioner is hereby authorized to charge the following fees to Deposit Account No. 50-1417:
- ☐ petition fee under 37 CFR 1.17(f), (g) or (h) ☒ any deficiency of fees and credit of any overpayments
- Enclose a duplicative copy of this form for fee processing.
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Petition Fees under 37 CFR 1.17(f):	Fee \$400	Fee Code 1462
For petitions filed under: § 1.53(e) - to accord a filing date. § 1.57(a) - to according a filing date. § 1.182 - for decision on a question not specifically provided for. § 1.183 - to suspend the rules. § 1.378(e) for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent. § 1.741(b) - to accord a filing date to an application under §1.740 for extension of a patent term.		
Petition Fees under 37 CFR 1.17(g):	Fee \$200	Fee code 1463
For petitions filed under: §1.12 - for access to an assignment record. §1.14 - for access to an application. §1.47 - for filing by other than all the inventors or a person not the inventor. §1.59 - for expungement of information. §1.103(a) - to suspend action in an application. §1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available. §1.295 - for review of refusal to publish a statutory invention registration. §1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued. §1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent. §1.550(c) - for patent owner requests for extension of time in <u>ex parte</u> reexamination proceedings. §1.956 - for patent owner requests for extension of time in <u>inter partes</u> reexamination proceedings. § 5.12 - for expedited handling of a foreign filing license. § 5.15 - for changing the scope of a license. § 5.25 - for retroactive license.		
Petition Fees under 37 CFR 1.17(h):	Fee \$130	Fee Code 1464
For petitions filed under: §1.19(g) - to request documents in a form other than that provided in this part. §1.84 - for accepting color drawings or photographs. §1.91 - for entry of a model or exhibit. §1.102(d) - to make an application special. §1.138(c) - to expressly abandon an application to avoid publication. §1.313 - to withdraw an application from issue. §1.314 - to defer issuance of a patent.		

Name (Print/Type)	Colin D. Barnitz	Registration No. (Attorney/Agent)	35,061
Signature		Date	July 27, 2005

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



Appl. No. : 10/771,453 Confirmation No. 2950
Applicant : WATANABE, Y. et al.
Filed : February 5, 2004
Title : STORAGE SYSTEM, AND CONTROL METHOD, JOB
SCHEDULING PROCESSING METHOD, AND FAILURE
HANDLING METHOD THEREFOR, AND PROGRAM FOR
EACH METHOD
TC/AU : 2186
Examiner : TBD
Docket No. : NIT-409
Customer No.: 24956

PETITION TO MAKE SPECIAL
(ACCELERATED EXAMINATION UNDER MPEP § 708.02(VIII))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The Applicants petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d). In support of this Petition, pursuant to MPEP § 708.02(VIII), Applicants state the following.

(A) REQUIRED FEE

This Petition is accompanied by the fee set forth in 37 CFR § 1.117(h).

Payment of the fee has been made in the manner set forth below in Section (G).

(B) ALL CLAIMS ARE DIRECTED TO A SINGLE INVENTION

Following the Preliminary Amendment filed on the same date as this paper, claims 1-11 are pending in the application. All the pending claims of the application are directed to a single invention. If the Office determines that all claims in the application are not directed to a single invention, Applicant will make election without traverse as a prerequisite to the grant of special status in conformity with established telephone restriction practice.

As set forth in independent claims 1, 6 and 10, the invention is generally directed to a data duplication control method, program and apparatus. Under claim 1, the invention is a storage system comprising: a port functioning as an interface to a host; a cache memory; a shared memory; a control device connected to said port, said cache memory, and said shared memory through a connection line; and one or more disk devices connected to said control device, said disk devices comprising a plurality of physical devices, and whereby at least one logical device is provided for said host; wherein said storage system is coupled to a service terminal connected thereto for receiving first priority information on each logical device provided for said host; wherein said control device maps more physical devices to a logical device with a high priority than that with a low priority based on said first priority information received from said service terminal; and wherein in the event of a failure, said control device performs control such that data held in said cache memory and belonging to

each logical device is saved to the physical devices mapped to each said logical device.

Additionally, under independent claim 6, the invention is a method for controlling a storage system which includes: a port functioning as an interface to a host; a cache memory; a shared memory; a control device connected to said port, said cache memory, and said shared memory through a connection line; and one or more disk devices connected to said control device, said disk devices comprising a plurality of physical devices, and whereby at least one logical device is provided for said host; wherein said method comprises: a first step of receiving first priority information on each logical device provided for said host; and a second step of mapping more of said physical devices to a logical device with a high priority than that with a low priority based on said first priority information received at said first step, and in the event of a failure, saving data held in said cache memory and belonging to each logical device to the physical devices mapped to each said logical device.

Furthermore under independent claim 10, the invention is a method for controlling a storage system which includes: at least one port functioning as an interface to at least one host; at least one cache memory; at least one shared memory; at least one control device connected to said at least one port, said at least one cache memory, and said at least one shared memory through at least one connection line; and one or more disk devices connected to said at least one control device, said disk devices comprising a plurality of physical devices, and whereby at

least one logical device is provided for the at least one host; wherein said method comprises: a first step of receiving first priority information on each logical device provided for said at least one host; a second step of mapping more of said physical devices to a logical device with a high priority than that with a low priority based on said first priority information received at said first step, and in the event of a failure, saving data held in said at least one cache memory and belonging to each said logical device to the physical devices mapped to each said logical device; a third step of storing a mapping relationship between each logical device and the physical devices into said at least one shared memory, said mapping relationship being established based on said first priority information received at said first step; a fourth step of receiving second priority information indicating a task priority; and a fifth step of, in the event of a failure, performing control such that a job with a high priority is executed after it is dequeued from a priority queue within said storage system based on said second priority information received at said fourth step.

(C) PRE-EXAMINATION SEARCH

A pre-examination search has been conducted, directed to the invention as claimed. The pre-examination search was conducted in the following US Manual of Classification areas:

<u>Class</u>	<u>Subclass</u>
709	219, 220, 230
710	52
711	111-112, 114, 130, 135, 161
714	2, 5, 114, 151, 723

Furthermore, a keyword search was conducted on the USPTO's EAST database, including the US patent database, the published US patent applications database, and the European and Japanese patent abstract databases. In addition, a search for non-patent literature was conducted on the ACM (Association for Computing Machinery) online databases.

(D) REFERENCES DEEMED MOST-CLOSELY RELATED TO THE SUBJECT MATTER ENCOMPASSED BY THE CLAIMS

Based upon a review of the documents located by the search and the documents already of record in the application, the references deemed to be most-closely related to the subject matter encompassed by the claims are listed below. These documents were made of record in the present application by the Information Disclosure Statements filed July 7, 2005.

<u>Document No.</u>	<u>Inventor</u>
US 5448719	Schultz et al.
US 6658434	Watanabe et al.
US 6886054	Taninaka et al.
US 20050005034	Johnson
JP 2001-175423	Kazutoshi

Because all of the above-listed references are already of record in the present application, in accordance with MPEP § 708.02(VIII)(D), additional copies of these documents have not been submitted with this Petition.

(E) DETAILED DISCUSSION OF THE REFERENCES

The references deemed most-closely related are discussed below in Section (E)2, pointing out, with the particularity required by 37 CFR 1.111 (b) and (c), how the claimed subject matter is patentable over the teachings of these documents.

1. Discussion of the Invention

The present invention provides a storage system capable of quickly saving data from cache memories to disk devices in the event of a failure, thereby preventing loss of important data with a high priority. The present invention can quickly destage dirty data in cache memories within a storage system to disk devices when a failure has occurred in the storage system, thereby preventing loss of important data with a high priority. It is submitted that the cited references, whether taken individually, or in combination, fail to teach or suggest the invention as claimed in independent claims 1, 6 and 10.

As set forth in claims 1, 6 and 10, a first feature of the invention includes mapping more physical devices to a logical device with a high priority than that with a low priority based on priority information received.

Additionally, as also recited in claims 1, 6 and 10, a second feature of the invention includes, in the event of a failure, saving data held in a cache memory and belonging to each logical device to the physical devices mapped to each logical device.

As will be discussed in more detail below, the prior art does not teach or suggest the above-described features.

2. Discussion of the References Deemed to be Most-Closely Related

The patent to Schultz et al., US 5448719, discloses two disk drive port connectors for interfacing with a transfer controller 44. Also provided are a posted write RAM 71, and a local processor 30 that controls hard-disks 56-58. The hard-disks 56-58 are connected to the transfer controller 44. Dirty data is written to the posted write RAM 71 intended for the disk array system 56-58. A data flush routine flushes dirty data to the disk array system when expedient. (See e.g., Abstract; column 4, lines 6-49; column 6, lines 28-68; column 7, lines 1-9; and Figure 1.) However, unlike the present invention, Schultz et al. do not disclose receiving priority information on logical devices. More particularly, Schultz et al. do not disclose mapping more physical devices to a logical device with a high priority than that with a low priority based on priority information received, as set forth in claims 1, 6 and 10.

The patent to Watanabe et al., US 6658434, discloses a host interface 112 in communication with a host 101. A control memory 106 is a memory to store control information necessary for a control processor 105 to control disk subsystem 109. Control processor 105 controls disk subsystem 109 (storage volumes 108a-n) according to a request sent from the host 101. The storage volumes 108a-n are connected to the control memory 106. A control memory 1506 stores positional

information 1510 which is mapping information to indicate a correspondence between a logical volumes and physical volumes. (See e.g., Abstract; column 3, lines 31-45; column 13, lines 3-10; and Figures 1, 3, and 13-15.) However, unlike the present invention, Watanabe et al. do not disclose receiving priority information on logical devices. More particularly, Watanabe et al. do not disclose mapping more physical devices to a logical device with a high priority than that with a low priority based on priority information received, as recited in claims 1, 6 and 10. Further, Watanabe et al. do not disclose, in the event of a failure, saving data held in a cache memory and belonging to each logical device to the physical devices mapped to each logical device, as set forth in claims 1, 6 and 10.

The patent to Taninaka et al., US 6886054, discloses a storage system having a storage controller 310, including channel adapters 311 for controlling each of the connection ports; a cache memory 314; a shared memory 313; and disk adapters 312. Physical disk devices 300 are connected to disk adapters 312. The storage system is coupled to a management server 50 via a LAN. A logical device management table 600 stored in the storage device indicates how logical devices 32 are arranged in the physical devices 300. (See, e.g., Abstract; column 7, lines 24-40; and Figures 1-2, and 6-9.) However, unlike the present invention, Taninaka et al. do not disclose do not disclose receiving priority information on logical devices. More particularly, Taninaka et al. do not disclose mapping more physical devices to a

logical device with a high priority than that with a low priority based on priority information received, as recited in claims 1, 6 and 10.

The published patent application to Johnson, US 20050005034, discloses a storage subsystem 14 that includes multiple logical volumes identified as logical unit numbers (LUNs) 16a, 16b, and 16c. A LUN priority mapping 20 determines a priority of the LUN associated with the applications 6a, 6b, and 6c. (See, e.g., Abstract and paragraphs 18-19, 23, and Figures 1-3.) However, while Johnson sets a priority for LUNs, Johnson does not disclose receiving priority information for mapping, or saving data in cache to plural physical devices in event of a failure. More particularly, Johnson does not disclose mapping more physical devices to a logical device with a high priority than that with a low priority based on priority information received, as recited in claims 1, 6 and 10. Further, Johnson does not disclose, in the event of a failure, saving data held in a cache memory and belonging to each logical device to the physical devices mapped to each logical device, as set forth in claims 1, 6 and 10.

The Japanese patent publication to Kazutoshi, JP 2001-175423, discloses a means for detecting that a failure is generated in physical disks. A means is provided for restoring data stored in the physical disk in which the failure is generated among the data of the priority logical disks from the read data. (See, e.g., Abstract, Solution, and Figure.) However, unlike the present invention, Kazutoshi

does not disclose receiving priority information on logical devices. More particularly, Kazutoshi does not disclose mapping more physical devices to a logical device with a high priority than that with a low priority based on priority information received, as recited in claims 1, 6 and 10.

(F) CONCLUSION

As demonstrated by the above discussion, the references fail to teach or suggest mapping more physical devices to a logical device with a high priority than that with a low priority based on priority information received, as recited in claims 1, 6 and 10.

Additionally, the references fail to teach or suggest, in the event of a failure, saving data held in a cache memory and belonging to each logical device to the physical devices mapped to each logical device, as recited in claims 1, 6 and 10.

Thus, it is submitted that all of these claims are patentable over the cited references taken individually, or in combination with each other. The remaining claims are dependent claims, claim additional features of the invention, and are patentable at least because they depend from allowable base claims. Accordingly, the requirements of 37 CFR §1.102(d) having been satisfied, the Applicants request that this Petition to Make Special be granted and that the application be examined according to prescribed procedures set forth in MPEP §708.02 (VIII).

The Applicants prepared this Petition in order to satisfy the requirements of 37 C.F.R. §1.102(d) and MPEP §708.02 (VIII). The pre-examination search required by

these sections was “directed to the invention as claimed in the application for which special status is requested.” MPEP §708.02 (VIII). The search performed in support of this Petition is believed to be in full compliance with the requirements of MPEP §708.02 (VIII); however, Applicants make no representation that the search covered every conceivable search area containing relevant prior art. It is always possible that prior art of greater relevance to the claims may exist. The Applicants urge the Examiner to conduct his or her own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited above and any other prior art that may be located by the Examiner’s independent search.

Further, while the Applicants have identified and discussed certain portions of each cited reference in order to satisfy the requirement for a “detailed discussion of the references, which discussion points out, with the particularity required by 37 C.F.R. §1.111(b) and (c), how the claimed subject matter is patentable over the references” (MPEP §708.02(VIII)), the Examiner should not limit review of these documents to the identified portions, but rather is urged to review and consider the entirety of each reference.

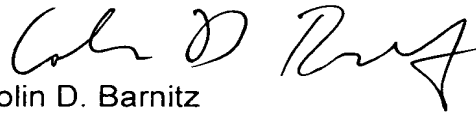
(G) FEE PAYMENT (37 C.F.R. 1.17(h))

The fee required by 37 C.F.R. § 1.17(h) is to be paid by:

- ☒ the Credit Card Payment Form (attached) for \$130.00.
- ☐ charging Account 50-1417 the sum of \$130.00.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417. A duplicate of this petition is attached.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Colin D. Barnitz". The signature is fluid and cursive, with the first name "Colin" being more prominent.

Colin D. Barnitz
Registration No. 35,061

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Date: July 27, 2005